REMARKS

Claim Rejections – 35 U.S.C. § 103

The Examiner has rejected claims 1-9 under 35 U.S.C §103(a) as being unpatentable over Lin (U.S. Patent 6,297,554) in view of Gnade (U.S. Patent 5,470,802).

Applicant respectfully asserts that the cited references fail to teach or render obvious Applicant's invention as claimed in claims 1-9.

With respect to independent claim 1, Applicant teaches and claims a process of lowering a parasitic capacitance between interconnect lines by forming a first dielectric layer and patterning the first dielectric layer such that a plurality of vertically oriented posts are formed, with each post having a top surface. The first dielectric layer has a dielectric constant. The process further comprises the formation of a second dielectric layer over and adjacent to the posts, where the second dielectric layer has a dielectric constant that is lower than the dielectric constant of the first dielectric layer. The above mentioned posts are formed to provide a mechanical reinforcement of the bulk of the inter-layer dielectric material. Finally, the process comprises polishing the second dielectric layer such that its top surface is substantially even with the top surfaces of the posts and the formation of an inlaid metal interconnection in the second dielectric layer.

On the other hand, Lin discloses forming a dielectric layer, where the structure of the dielectric layer comprises at least one trench with an aspect ratio greater than 3.5, with an insulating layer in the trench and a void formed within the insulating layer (Col. 1, line 52 to 62). The trenches 72 taught by Lin must be of a very specific size, having an

aspect ratio greater than 3.5. Note Fig. 2 and Col. 3, lines 30 to 32 of Lin. Lin teaches that when the insulating layer is deposited over the trenches, said trenches having an aspect ratio greater than 3.5, the insulating layer forms overhangs on the dielectric layer around the top edges of the trenches. These overhangs close the trenches so as to form voids (Col. 3, line 45 to 50). The voids created by Lin prevent the area adjacent to the walls to be substantially filled by a second dielectric layer, as taught and claimed by Applicant in Claim 1. Lin teaches away from substantially filling up the area adjacent to walls 60 with a second dielectric layer. Lin teaches that the trenches between the walls are *not* substantially filled with a second dielectric, but instead contain voids.

Furthermore, Lin is very specific in defining the aspect ratio of the trench. By defining the aspect ratio, Lin is effectively limiting the amount of the second dielectric layer that may be formed within the trenches. If the aspect ratio of the trenches is less than 3.5, a void will not be formed within the trench after dielectric layer 82 is deposited. An example of this can be seen in Figure 3 of Lin. Figure 3 illustrates the deposition of dielectric layer 82. Insulating layer 82 forms overhangs over the trenches having an aspect ratio that is greater than 3.5, forming voids 73. However, no voids will be formed in the trenches that have an aspect ratio less than 3.5, as illustrated by trenches 65 and 66, which do not have an overhang of the insulating layer, nor do they contain a void. Thus, because the trenches must be relatively narrow, only a small amount of insulating layer 82 will be formed within the trenches relative to the amount of dielectric material 60, which forms the walls of the trenches.

Lin teaches away from using the second dielectric layer to make up the bulk of the interlayer dielectric material, as taught by Gnade. The second dielectric layer of Lin

could not make up the bulk of Lin's interlayer dielectric material because if it did, voids would not be formed in the manner set forth by Lin. Lin teaches away from using the second dielectric layer as the bulk of the interlayer dielectric material, as taught and claimed by Applicant in Claim 1, because Lin sets forth a very specific aspect ratio that determines the area of the region where the second dielectric layer may be formed.

Thus, Applicants respectfully submit that claim 1 is not rendered obvious by Lin or Gnade, individually or in combination, because these references do not teach or suggest each and every element of these claims.

Claims 2-9 are dependent upon independent claim 1. Thus, for at least the reasons advanced above with respect to independent claim 1, Applicants respectfully submit that neither Lin nor Gnade individually or in combination, render these dependent claims obvious.

Furthermore, Applicant asserts that even if Lin and Gnade may be properly combined, the references together fail to teach or suggest all the elements of claim 1 because neither Lin nor Gnade teaches posts as taught and claimed by applicant.

Lin describes trenches 72 formed between walls 60, which are different than the posts disclosed in the presently claimed invention. Lin does not teach posts as disclosed in the presently claimed invention. Applicant teaches and claims the use of posts 502 on a substrate to provide structural reinforcement to the second layer dielectric during the polishing process. (Fig. 5) The posts are discrete features, having top surfaces such as posts 502a and 606. (Fig. 6) The trenches 72 taught by Lin must be of a specific size, having an aspect ratio greater than 3.5, and are defined by a number of walls 60. In order for the trenches to have an aspect ratio of greater than 3.5, the height and spacing of

walls 60 is critical. Note Fig. 2, Fig. 3, and Col. 3, lines 30 to 50 of Lin. Lin teaches that when the insulating layer is deposited over the trenches, said trenches having an aspect ratio greater than 3.5, the insulating layer forms overhangs on the walls 60 of the dielectric layer around the top edges of the trenches. These overhangs close the trenches so as to form voids (Col. 3, line 45 to 50). The voids created by the overhangs effectively lower the dielectric constant of the dielectric layer. If one were to use a post as described and shown in Fig. 6 of the presently claimed invention for the purpose of Lin, overhangs would not be formed and, therefore, voids would not be formed in the manner described by Lin. Therefore Lin fails to teach forming a plurality of vertically oriented posts on a substrate, as taught by Applicant.

Additionally, Gnade teaches dielectric spacers 58 that are distinct from the posts taught and claimed by Applicant. Applicant teaches and claims in claim 1: "...forming a first dielectric layer on a substrate, wherein the first dielectric layer has a dielectric constant; patterning the first dielectric layer such that a plurality of vertically oriented posts are formed on the substrate, the post having a top surface..." The dielectric spacers 58 of Gnade are not formed on the substrate (22); instead they are formed on the top surface of conductors 24. Note Fig. 8A of Gnade. Furthermore, the purpose of these spacers is not to provide mechanical reinforcement of porous dielectric 28. The spacers of Gnade are used to protect the conductors during planarization. Gnade states in Col. 9, lines 7-11: "An advantage of this embodiment is that the addition of the spacers allows the removal of a top portion of the porous dielectric, without the possibility of removing a portion of the conductors."

Therefore, Gnade fails to teach forming a plurality of vertically oriented posts on a substrate, as taught by Applicant.

Thus, it is Applicant's understanding that both Lin and Gnade fail to teach forming a plurality of vertically oriented posts on a substrate.

Claims 2-9 are dependent upon independent claim 1. Thus, for at least the same reasons advanced above with respect to independent claim 1, Applicant respectfully submits that neither Lin nor Gnade, independently or in combination, render these dependent claims obvious.

Applicant respectfully requests the removal of the 35 U.S.C. §103(a) rejection of claims 1-9 and seeks an early allowance of these claims.

If there are any additional charges, please charge Deposit Account No 02-2666.

Respectfully submitted,

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